ORDER

6850.29

PROJECT IMPLEMENTATION PLAN FOR THE MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS WITH REMOTE MONITORING SUBSYSTEM (MALSR WITH RMS)

December 5, 1989

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Foreword

This project implementation plan provides management direction for the implementation and acceptance of the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) with Remote Monitoring Subsystem (RMS) into the National Airspace System (NAS). It defines the major functional responsibility levels, management direction, and overall program guidance to all responsible levels within the FAA for the procurement and implementation of the MALSR with RMS.

Robert E. Brown
Director, Program Engineering Service

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CHAPTER 1. GENERAL

1. PURPOSE. This project implementation plan (PIP) provides technical guidance and direction for implementing the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) with Remote Maintenance Subsystem (RMS) into the National Airspace System (NAS).

2. DISTRIBUTION. This order is distributed to branch level in the Program Engineering, Systems Maintenance, and Logistics Services; Aviation Standards National Field Office, Office of Airport Standards, and Office of System Engineering and Program Management; to division level in the Flight Standards Service and Associate Administrator for Air Traffic in Washington headquarters; to branch level in the regional Airway Facilities, Airports, Air Traffic, and Flight Standards divisions; to the Director, FAA Technical Center,to branch level in the FAA Depot and FAA Academy at the Mike Monroney Aeronautical Center; and limited distribution to the Airway Facilities General NAS sectors, sector field offices, sector field units, and sector field office units.

3. AUTHORITY TO CHANGE THIS ORDER. The Director, Program Engineering Service, shall approve all changes to this order.

4.-19. RESERVED.

CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS. The MALSR with RMS program consists of procuring the Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) with Remote Monitoring Subsystem (RMS), and Link Control Units (LCUs), and installing and integrating the system as part of a visual aids establishment program, or as part of the Approach Lighting System Improvement Program (ALSIP).

21. PURPOSE. The primary purpose of the MALSR with RMS is to provide visual approach guidance on category I runways to the pilot. The remote maintenance monitoring subsystem performs a secondary function of providing maintenance monitoring for the MALSR.

22. HISTORY.

a. The present MALSR population is comprised of several generations of MALSR equipment, none of which have a remote maintenance monitoring capability. Because no RMM capability was available on these older systems, equipment degradation sometimes went unnoticed until the equipment failed. The decision to provide RMM for the MALSR system attempts to solve this problem by making failures of MALSR equipment more predictable. By "managing" these failures, it is anticipated that maintenance visits can be both reduced in frequency and scheduled with other visits. Availability of the MALSR system is also anticipated to improve since failures are reported by the RMS on a real-time basis and degradations are often repaired before the system fails.

b. On June 29,1989, an 8A contractor, AVW Electronic Systems, Inc. of Inglewood, California was selected to design, produce, test, and provide engineering support for a new MALSR system with RMS under the provisions of contract DTFA-01-89-Y-01010.

23.-29. RESERVED.

CHAPTER 3. PROJECT DESCRIPTION

30. FUNCTIONAL DESCRIPTION. The basic function of the MALSR with RMS is to provide the pilot with visual information on runway alignment, height perception, roll guidance, and horizontal reference. A secondary function of remote maintenance monitoring is accomplished by the remote monitoring subsystem in conjunction with the link control unit. Lighting control will be available from the Tower Control Computer Complex (TCCC) at those airport traffic control towers (ATCT) so equipped. At non-TCCC ATCTs, control may be provided via ground-to-ground Remote (Radio) Control System (RRCS), a switch in the control cabinet or, if the airport is unmanned, via air-to- ground VHF radio from an aircraft.

a. Control Cabinet. The control cabinet accepts the 120/240 volt ±10 percent, 60 Hz, 3-wire input power required to operate the MALSR system. The control cabinet then provides power to the 15 kilovoltampere (kVA) power transformer and to the individual control cabinets. The control cabinet also provides signals to control intensity steps for both the steady burning and the sequenced flasher lights and provides the timing sequence for the sequenced flasher lights. The control cabinet is also used to configure and select either local or remote operation of the MALSR system as indicated in Table 3-1, Control Switches. Another function of the control cabinet is to interface test points and control signals to a remote monitoring subsystem and to interface two basic functions (turning ON and increasing the intensity of the MALSR system) with the remote control circuitry.

SWITCH POSITION	FUNCTION
Switch #1	
REMOTE	MALSR system is controlled remotely.
OFF	MALSR deenergized.
LOW	MALSR operating on low intensity.
MEDIUM	MALSR operating on medium intensity.
HIGH	MALSR operating on high intensity.
Switch #2 (Flasher)	
ON	Sequenced flashing lights are on.
OFF	Sequenced flashing lights are off.

TABLE 3-1. CONTROL SWITCHES

b. Sequenced Flasher Assembly. The sequenced flasher assembly consists of flasher light units and individual control cabinets.

(1) The MALSR system requires five sequenced flasher light units all powered and controlled from the individual control cabinet. The flasher lights flash in sequence toward the runway threshold and produce a visual effect of a ball of light moving toward the runway at a high rate of speed.

(2) Each flasher light unit is controlled by an individual control cabinet. The triggering circuit of each flasher light unit is located in the individual control cabinet. The individual control cabinets accept power and control signals from the control cabinet and control the intensity of the flasher lights through switching capacitors in the flasher individual control cabinet.

c. Junction Box. The junction box interfaces the power and control signals from the control cabinet to the individual control cabinets.

d. Power Transformer Unit. The power transformer functions to provide three intensity steps for the steady burning lights of the MALSR system. The three intensities for the steady burning lights are obtained from the secondary outputs of the power transformer unit. The input to the transformer primary is supplied by the control cabinet. Table 3-3, Power Transformer Parameters, shows the secondary outputs at each intensity step for a 240 V ac input to the transformer primary.

e. Flasher Tester. The flasher tester is used to verify the performance of any functional module in the individual control cabinet. Among the functions tested are line voltages and control signals from the control cabinet to the individual control cabinet, power circuits, the triggering circuit of the individual control cabinet, and the power and control signals from the individual control cabinet to the flasher light unit.

f. Aiming Device. The aiming device for the PAR-28 and PAR-56 lamps and the flasher unit is an accessory that permits field aiming of the lamp axis perpendicular to the plane of the cover glass to any angle from 0 to +25 degrees above the horizontal. The final aimed angle of the lamp with the device unattached shall be accurate within one degree of the actual angle.

g. Remote Monitoring Subsystem. The primary function of the remote monitoring subsystem (RMS) is to remotely monitor the performance parameters of the MALSR equipment, preprocess the monitored signals from the current sensors and MALSR control cabinet, and to transmit the digitized data to a centralized link control unit. Table 3-2, MALSR Performance Parameters, shows those parameters which are remotely monitored. In addition, the MALSR RMS exercises minor control over the MALSR equipment upon receipt of a command from the link control unit ie. allows for only two functions (turning on the MALSR and increasing the intensity), and provides a terminal interface suitable for use with a portable terminal. A remote maintenance monitoring capability for an air-to-ground receiver (RC 1T5A, manufactured by Control Industries, Urbana, Ohio, or equivalent) is also available with an optional modification kit. The RMS power supply also provides a +9 to +12 V dc (15 watt) power source for radio link operations with the LCU. Preset alarm limits for flasher misfires are programmable; additional detail information will be made available to the users in the near future, but not necessarily as changes to this order.

Parameters	Normal	Prealarm	Alarm
1. <u>MALS</u>			
a. Control cabinet input voltage	228 - 252 V ac (240 V ac nominal)		Less than 228 V ac more than 252 V ac
b. Transformer output			
(1) High intensity	228 - 252 V ac (240 V ac nominal)		Less than 228 V ac more than 252 V ac
(2) Medium intensity	142.5 - 157.5 V ac (150 V ac nominal)		Less than 142.5 V ac more than 157.5 V ac
(3) Low intensity	95 - 105 V ac (100 V ac nominal)		Less than 95 V ac more than 105 V ac
c. Overall system	All on		More than one light bar in the prealarm state, as defined in (d); more than 20 percent (random) of lamps out
d. Light bar lamps			
(1) 5-lamp bar	All lamps on	More than 2 lamps out	
(2) Threshold bar where existing	All lamps on	More than 3 lamps out	
(3) 1000 - foot bar	All lamps on	More than 3 lamps out	
2. <u>RAIL</u>			
a. Input voltage	228 - 252 V ac (240 V ac nominal)		Less than 228 V ac more than 252 V ac
b. Flashers	All flashers on	1 flasher out	2 or more flashers out
c. Flashing rate	120 $\pm$2 flashes/minute (2 flashes/second)		Less than 118 flashes per minute, more than 122 flashes/minute
d. Misfires	1 to 7 over a 100 - trigger sample interval		More than 7 over a 100 - trigger sample interval

<u>TABLE 3-2. MALSR PERFORMANCE PARAMETERS</u>

h. Link Control Unit. The link control unit acts as a central point of communication and manages all communication (1) between the maintenance processor subsystem (MPS) and equipment RMSs, (2) between the MPS and the link control unit's terminal interface, and (3) between the link control unit's terminal interface and the equipment RMSs. The link control unit acts as a complex station, performing as a secondary station on the MPS interface, and as a primary station on the link control unit to equipment RMSs multipoint data link. The link control unit power supply provides dc operating voltages for all functions within the link control unit and also provides a +9 to +12 V dc (15 watt) power source for radio link operations.

31. PHYSICAL DESCRIPTION.

a. MALSR SYSTEM. The MALSR system (figure 3-1) consists of two lighting portions. The first portion is referred to as the medium intensity approach lighting system (MALS). The MALS consists of seven, five-light bars installed on the extended runway centerline. The lights used for these light bars are 120-watt, 120-volt, PAR-28 spot lamps. The first bar is located 200 feet from the runway threshold and the remaining bars at 200-foot intervals out to 1,400 feet from the threshold. Two additional five-light bars are located, one on each side of the centerline bar, 1000 feet from the runway threshold forming a crossbar 66 feet long. A row of 18 green-filtered, 300-watt, 120-volt, PAR-56 threshold lights are located within 10 feet of the runway threshold. All lights in the MALS are white except for the threshold lights which are green. The second portion is referred to as the runway alignment indicator lights (RAIL). The RAIL consists of five sequenced flashers located on the extended runway centerline. The first flasher is located 200 feet from the approach end of the MALS. Successive units are located at each 200-foot interval out to 2,400 feet from the runway threshold.

(1) Control Cabinet. The MALSR control cabinet is an outdoor, waterproof, dusttight, nonventilated enclosure of sufficient size to contain the power and control circuitry and for interfacing test points and control signals to the remote monitoring subsystem. The cabinet housing is rigidly constructed and will not distort or bend under normal methods of shipping, handling, and installation. The cabinet housing has been equipped with a hinged door with provisions for padlocking and has adequate internal clearance to facilitate installation and maintenance of components. Mounting lugs or bolts are provided on the back of the cabinet for mounting the cabinet vertically. Space has been reserved in the cabinet for all external cable

connections. A maintenance light and convenience outlet are included for maintenance purposes.

(2) Sequenced Flasher Assembly. Each sequenced flasher assembly consists of an individual control cabinet and a flasher light unit.

(a) The individual control cabinet is an outdoor, waterproof, dusttight, nonventilated enclosure. The cabinet is of sufficient size to accommodate all the necessary components and wiring and to provide adequate clearance for field installation and maintenance. Two 2-inch (5.08 cm) threaded fittings are provided on the bottom of the cabinet for mounting purposes. Mounting lugs or bolts are also provided on the back of the cabinet to improve cabinet stability when necessary. A fitting on the bottom of the cabinet is provided to accommodate a 3/4-inch (1.9 cm) flexible conduit. Input power is controlled by a toggle switch. Lighting arresters to protect input and output power terminals, as well as input and output control signal terminals are also provided.

(b) The flasher light unit is a single raintight assembly constructed of rigid material. Each flasher light unit shall be assembled to a mounting base. The mounting base shall have an internal wireway for six wires to the lampholder. The mounting base permits rigid mounting of the complete identifier unit by either capping the open top of a frangible coupling, by capping the open top of a 2-inch electrical metallic tubing conduit, or by mounting into a lamp support. The flasher light unit has been provided with a means for continuous vertical adjustment of the light beam axis from horizontal to 25 degrees above horizontal. The flash tube is a plug-in type with a rated life of at least 1,000 hours when operated on the high intensity step and an effective intensity which does not decrease more than 30 percent during the minimum rated life. The weight of the entire flasher light unit, including the mounting attachments will not exceed 5 pounds (2.25 kilograms). Power is removed when the cabinet door is opened.

(3) Junction Box. Junction boxes are designed in accordance with FAA Drawing D-5140-2 except for the terminal blocks, which is designed to specification FAA-G-2100e, paragraph 3.5.34, and the replacement of 1-inch conduit hubs on the bottom of the box with 2-inch conduit hubs.

(4) Power Transformer Unit. The transformer cabinet is an outdoor, raintight enclosure of sufficient size to permit easy field installation of cable terminations. Mounting bolts or

lugs are provided on the back of the cabinet for mounting the cabinet in a vertical position. Access to the cabinet is through a raintight screw-held cover. Two external lightning arresters are provided for field mounting directly to the transformer cabinet. The power transformer unit is rated for 15 kVA, single phase, 120/240 volt input, 60 hertz and is a self-cooled dry type transformer. Taps are provided on the transformer primary to permit adjustment of secondary voltages to within ±2.5 percent of the secondary outputs specified in Table 3-3, Power Transformer Parameters.

Intensity Step	Secondary Output
High	120/240 volts ±0.5 percent
Medium	75/150 volts ±0.5 percent
Low	50/100 volts ±0.5 percent

TABLE 3-3. POWER TRANSFORMER VOLTAGE PARAMETERS

(5) Flasher Tester. The flasher tester is a single portable unit weighing not more than 20 pounds (9 kilograms (kg)). The tester is equipped with a plug that connects to a socket in the individual control cabinet. The flasher tester will contain a built-in voltohmmeter, any indicator lights and meters that are visible during both day and night operation.

(6) Aiming Device. The aiming device fits over the cover glass of the lamp and is held firmly in place by a pressure plate with adjustable spring tension. The aiming angle is indicated on a scale calibrated in one degree intervals. This is a functional requirement, not a device being provided on a product specification.

b. Remote Monitoring Subsystem. The MALSR RMS consists of voltage and current sensors, cabling, connectors, the mounting hardware necessary to route required samples of signals and control functions to the mounted units of the MALSR RMS and a data acquisition system. The data acquisition system consists of a dc power supply, a terminal interface for use with a portable terminal, a VMEbus interface card cage and provisions for interface with a government furnished (GFE) radio link for communication with a link control unit.

c. Link Control Unit. The link control unit consists of a dc power supply, a radio (GFE) operating in the UHF band, a VMEbus interface card cage and three data links. The three data links consist of a maintenance processor subsystem (MPS) interface, the link control unit to equipment RMSs multipoint data link, and the terminal interface. The link control unit is designed such that the capability of interfacing the link control unit with up to 10 MALSR RMSs can be expanded with the installation of an expansion kit. The expansion kit, when installed, expands the link control unit capability such that the link control unit has the capacity for interfacing with up to 20 MALSR RMSs.

32. SYSTEM REQUIREMENTS. MALSR system requirements include power, siting, operational, electromagnetic interference, and environmental considerations. Reliability, maintainability, accessibility, and interchangeability are also design requirements of the system.

a. Power. The MALSR operates on a 120/240 volt ±10 percent, 60 Hz, 3-wire commercial power source which is supplied to the control cabinet. The MALSR control cabinet supplies any power required for the remainder of the MALSR system. The link control unit and the RMS operate off a power supply designed to operate from a nominal 120 volt, 60 Hz power source. The link control unit and the RMS power supplies use the ac power source to provide the dc voltage needed for operation, and to provide a trickle charge to batteries for backup power when ac power is unavailable. Other power requirements for the MALSR are outlined in FAA Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities.

b. Siting. Whenever practicable the MALSR shall be installed in accordance with the ideal installation criteria below. Other installation criteria and permissible deviations are found in FAA Order 6850.2A, Visual Guidance Lighting Systems.

(1) Approach Light Plane. The lights in the approach light plane are in a single horizontal plane at the elevation of the runway threshold centerline. The approach light plane is 400 feet wide centered on the extended runway centerline, RAIL excepted.

(2) Clearance. No object protrudes above the approach light plane. For approach light plane clearance purposes, all roads, highways, vehicle parking areas, and railroads are considered as vertical solid objects.

(3) Location and Orientation. All light bars are installed perpendicular to the vertical plane containing the ALS centerline and as shown in Figure 3-1, MALSR System. The total overall length of the system is also shown in this figure.

(4) Visibility. There is a clear line-of-sight to all lights of the system from any point on a surface, one-half degree below the ILS glide path and extending 250 feet each side of the centerline, up to 1600 feet in advance of the outermost light in the system. For nonprecision approach systems where there is no ILS, a three degree glide path, intersecting the runway 1000 feet from the landing threshold, is assumed for determining the visibility requirement.

(5) RAIL. The ideal installation of the RAIL portion is that all sequence flashing lights be in a horizontal light plane with no obstruction penetrating the primary and secondary RAIL plane.

c. Operational. The MALSR system operates in either the local mode or off the remote control circuitry. Remote operation is accomplished through the remote control input to the control cabinet. Remote control provides for setting the MALSR system to one of three intensity levels, for turning the sequenced flashers on and off while maintaining intensity control on the steady burning lights, and for turning off the entire system. Only two functions are available for remote use at non-attended ATC towers, for safety purposes, the MALSR can only be powered "on" and increased in intensity level.

d. Electromagnetic Interference. Conducted interference levels on MALSR incoming ac power leads, control leads, signal leads, and interconnecting cables between parts shall not exceed the limits for CE03 as defined in MIL-STD-461 (equipment class ID). Similarly, radiated narrowband and broadband interference levels shall not exceed the limits for RE02 of MIL-STD-461 over the frequency range from 14 kilohertz (kHz) to 400 megahertz (MHz) at a distance of 20 feet (6.1 meters).

e. Reliability. The MALSR shall have a mean time between failures (MTBF) of not less than 2,500 hours. The MTBF for the RMS and LCU is 30,000 hours.

f. Maintainability. The MALSR shall have a mean time to restore (MTTR) of not more than 15 minutes with no single restoration exceeding 3 hours in duration and a mean periodic maintenance time (MPMT) not to exceed 2 hours per month including routine inspection.

g. Environmental. The MALSR with RMS is designed for continuous or intermittent operation under the following environmental conditions:

(1) Temperature. Ambient temperature between -55 and +70 degrees Centigrade (-67 and 158 degrees Fahrenheit).

(2) Altitude. Sea level to 10,000 feet (3,048 meters) mean sea level (msl).

(3) Humidity. Up to 100 percent relative humidity including conditions where condensation takes place in the form of both water and frost.

(4) Sand and dust. Exposure to wind-blown sand and dust particles as may be encountered in arid conditions.

(5) Salt spray. Exposure to salt-laden atmosphere with relative humidity of up to 100 percent.

(6) Rain. Exposure to wind blown rain.

(7) Solar radiation. Exposure to sunshine with ambient temperatures of -55 to +70 degrees Centigrade.

(8) Temperature shock. Exposure of external surfaces including light windows to a sudden application of cold water when the lights reach stable operating temperatures.

(9) Vibration. Vibrations in the frequency range of 10 to 2,000 hertz for PAR-38 and flasher light units.

h. Accessibility. The MALSR equipment is designed for optimum accessibility, operating compatibility, and maintenance. Each article of equipment and each major subassembly provides the required access to interior parts, terminals, and wiring for adjustments, circuit checks, and the removal and replacement of maintenance parts.

i. Interchangeability. All parts of the unit furnished under a single procurement will be manufactured to a tolerance that permit interchangeability of any part with a like part of any other unit.

33. INTERFACES. The MALSR system has the capability of being monitored by the remote maintenance monitoring system (RMMS) described in FAA-E-2782, Remote Maintenance Monitoring System, Core System/Segment Specification, when provided. Its other major interface points will normally be the Remote Control Interface Unit described in FAA-E-2663, Interface Unit MALSR Remote Control. The MALSR will also interface with the TCCC (where installed).

a. Remote Maintenance Monitoring System. Interfacing of the link control unit with the RMS units and the MPS is normally accomplished via the use of the built-in modems and the GFE radio links. The link control unit will be provided with a UHF radio link operating in the 406 to 420 MHz band. The radio frequencies assigned for the radios are site dependent. Therefore, it is imperative that any proposed changes to MALSR locations be initiated as soon as possible to place the proper radio at the correct site at minimal cost. Other interface criteria are described below.

(1) The MPS interface is designed in accordance with EIA Standard RS-232 wired as a synchronous data terminal equipment (DTE), duplex, type D interface. The MPS interface is wired to a rear mounted female MIL-C-24308 (MS 18275) connector. The data rate across the MPS interface shall be 2400 bps.

(2) The link control unit and the RMS terminal interfaces are both designed in accordance with EIA Standard RS-232, wired as asynchronous data interfaces, use even parity, and automatically adjust to the following baud rates: 110, 150, 300, 1200, 2400, 4800, and 9600. The terminal interface is wired to a front panel mounted female connector, MS18725, in accordance with MIL-C-24308. ASCII characters received via the terminal interface shall also be transmitted, i.e., echoed, as the characters are received.

(3) Normally the data interface between the link control unit and each equipment RMS is a half-duplex, 2400 bps, multipoint data radio link. However, provision to operate via a point-to-point, half-duplex, two-wire phone line is also available by means of wirestrapping. Minimum phone line quality in this configuration shall be 3002 (AT&T Tariff FCC-260) per Bell System Technical Reference Publication 41004, or equivalent.

Since AT&T FCC-260 has been replaced by AT&T Tariff 9,10,11, the current line equivalent is channel type 5 conditioned C-2 with protocol type NO of AT&T Publication 43202. The line may be unconditioned (basic) if the modems can still transmit 2400bps at an acceptable bit error rate. FAA Order 6000.22 is scheduled to be updated to provide guidelines for required line characteristics to remove dependence on the AT&T standard.

(4) In addition to the interface characteristics just mentioned, the link control unit will also be capable of interfacing with the RMS in accordance with EIA Standard RS-232 wired as a synchronous, DTE, duplex, type D interface. The DTE interface shall have the capability to utilize either the built-in modem for transmission or an external modem meeting the requirements of FED-STD-1005 (except paragraphs 2.2 and 2.4 and associated subparagraphs). Data rates across the DTE interface shall be programmable to 2400, 4800, 9600, and 19,200 bps.

b. Remote Control Interface Unit. The remote control interface unit provides the MALSR system with connectivity to two external remote control systems. One of these, the Remote (Radio) Control System (RRCS) described in FAA-E-2723, provides control of the MALSR system to an operator in the ATCT. The other, described in Advisory Circular AC 150/5345-49A, Specification L-854, Radio Control Equipment, provides control of the MALSR system at an unattended facility to the pilot via an air-to-ground receiver. The remote control interface unit is not provided with the MALSR system and must be purchased separately if required.

c. Tower Control Computer Complex (TCCC). The TCCC provides control instructions to the MALSR which permit the controller to turn the equipment on or off and to adjust light intensities. There will be no input to the TCCC directly from the MALSR although the lighting status display will show the on or off status and the intensity setting entered by the controller.

34.-39. RESERVED.

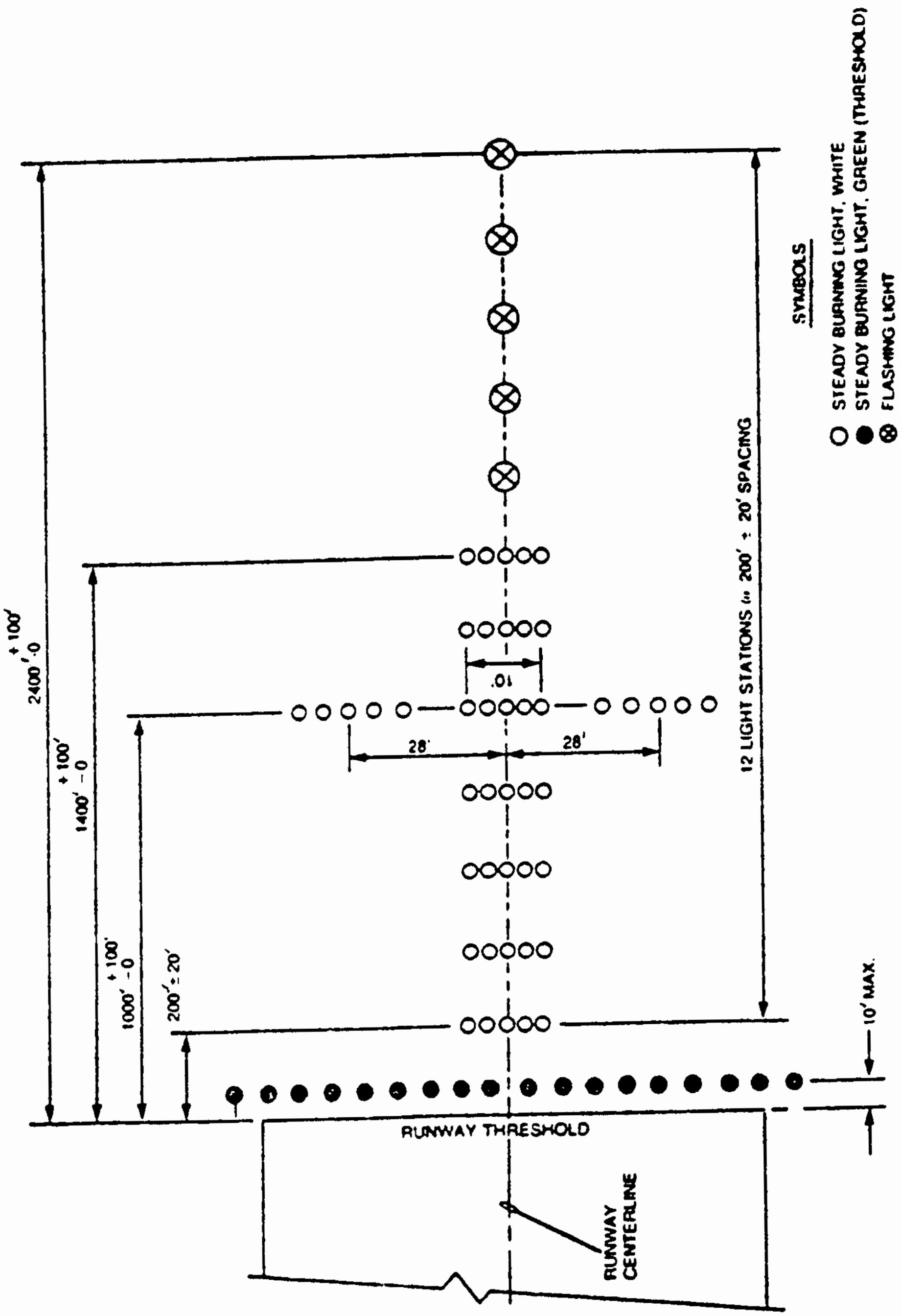

FIGURE 3-1. MALSR SYSTEM

Chapter 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The procurement of the MALSR equipment is divided by fiscal year. The FY86-FY 88 contract is a design/production contract which will provide 83 MALSR systems for delivery to the depot. The contract was awarded June 29,1989.

41. MILESTONE SUMMARY SCHEDULE. The current project schedule is shown in Table 4-1, MALSR with RMS Schedule. Project events are scheduled in relationship to the date of contract award. The dates listed are for those milestones completed or anticipated. This table is by no means an all inclusive list of project milestones necessary for project completion.

42. INTERDEPENDENCIES AND SEQUENCE. The following projects were identified as having interdependencies with the MALSR project. Because of the broad variation in site requirements, discussion of specific effects of each program on a site-by-site basis is beyond the scope of this PIP.

a. The Airport Cable Loop Program. The Airport Cable Loop Program establishes a network with all of the airport's power and control cables. The MALSR will precede the Airport Cable Loop Program at some locations which might lead to their being dropped from control cable loops, although power cable loops may still be required.

b. The Airport Telecommunications Program. The Airport Telecommunications Program will establish the specifications and criteria for a reliable and flexible distribution system for low activity and medium activity airports. The Airport Telecommunications Program is related to all airport projects which require buried cable for control signals or communications between sites. The Airport Telecommunications Program investigates frequency interference and alternative communications media within the NAS plan. The MALSR impacts this program only in the Landing area since the MALSR does require some buried cable for the system to function.

c. The Remote Maintenance Monitoring System. The Remote Maintenance Monitoring System (RMMS) program has been developed to provide maintenance monitoring and control equipment for FAA facilities so that performance monitoring, certification, and control could be accomplished from centralized work centers. In some cases the RMMS program may not be fully implemented until some time after installation of the MALSR system has been completed. In these situations, the reduction in the frequency of onsite maintenance visits derived from the integration of the MALSR RMS with the RMMS may not be realized until some time after the MALSR has been installed. The Remote Maintenance Monitoring System (RMMS) program will have to be considered on a case-by-case basis for each air facility affected.

43.-49. RESERVED.

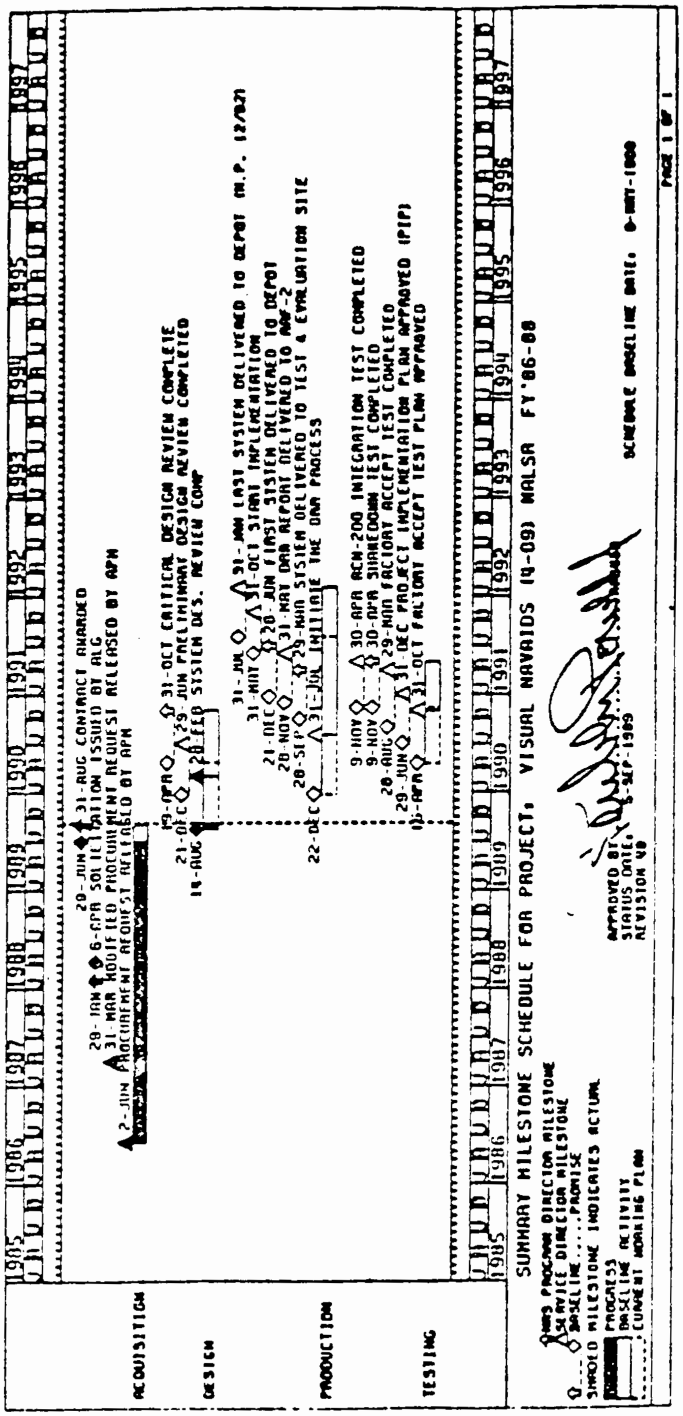

TABLE 4-1. MILESTONE SUMMARY SCHEDULE

CHAPTER 5. PROJECT MANAGEMENT

50. PROJECT MANAGEMENT, GENERAL. This section describes the organizations with the Program Engineering Service (APS) that are directly responsible for MALSR program management.

a. Program Engineering Service (APS). The Program Engineering Service manages, directs, and executes the FAA's engineering and management activities related to facilities design, air navigation, landing aids, and air traffic control facilities and equipment to ensure that the NAS is efficient, economical and responsive to operational needs.

b. Navigation/Landing and Facility Monitoring Division (APS-400). This division is the principal element of the service responsible for the design, development, and implementation of systems, programs and facilities requirements for navigation and landing systems.

c. Approach Lighting and Visual Range Branch (APS-450). The Approach Lighting and Visual Range Branch is the principal element of the division responsible for design, development, and implementation responsibilities for instrument landing systems and landing aids.

d. MALSR Program. The MALSR Program Manager is supported by engineering and is responsible for managing the design, development, and implementation activities associated with the MALSR with RMS. His duties include:

(1) Management. Planning, scheduling and managing the program from design through commissioning, logistics support, training, and program completion. Responsible for systems engineering, system design, man- machine interface, component design and related functional, technical, and performance characteristics. Acts as chairman of the National Airspace Integrated Logistics Support (NAILS) Management Team (NAILSMT).

(2) Logistic Support. Provides, in conjunction with the NAILSMT, the technical guidance to define the logistics support requirements for proper logistics management and support of the MALSR with RMS.

(3) Modernization Input. Developing service input for the modernization or in-service improvement of equipment.

(4) Technical Officer. Providing engineering advice and consultation to contracting officer during procurement,

serving as technical officer, and reviewing contractor requests and progress payments.

(5) Cost Data. Developing and providing cost data, controlling assigned funds, and adjusting program schedules and objectives as necessary.

(6) Technical Installation Instructions. Preparing technical installation instructions.

(7) Maintenance Instructions. Preparing maintenance instructions, identifying training, provisioning and test requirements, and directing the preparation of maintenance technical handbooks.

(8) Testing. Reviews and approves manufacturers' equipment test procedures. Establishes requirements and approves plans for test and evaluation of engineering activities of the FAA technical center.

(9) Inventory. Manages in transit material for construction and installation. Maintains currency of material systems and control over equipment inventory.

(10) Installation. Management of installation activities for current and future systems to assure a high level of system performance.

(11) Acceptance. Providing research, engineering, development, design and systems analyses associated with acquisition and acceptance of hardware and software.

51. PROJECT CONTACTS. This paragraph lists MALSR project contacts and their addresses.

(a) Cluster Manager. Rod Gill, APS-400, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591, FTS 267-3595, (202) 267-3595.

(b) Program Manager. Reuben Powell, APS-450, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591, FTS 267-7507, (202) 267-7507.

(c) Project Engineer. Arthur Prigal, APS-450, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS 267-8498, (202) 267-8498.

52. PROJECT COORDINATION. The MALSR with RMS project requires coordination with other services within the FAA, with regional representatives and with the contractor on-site representative during installation. Coordination by and with the organizations below is essential for them to efficiently accomplish their functions.

a. Maintenance Engineering Division (ASM-100). ASM-100 reviews procurement specifications to ensure the design meets the reliability and maintainability requirements and supports the general maintenance philosophy. ASM-100 also coordinates the development of an integrated logistic support plan for the MALSR system acquisition and develops maintenance standards and plans for implementation of maintenance concepts.

b. Maintenance Operations Division (ASM-200). ASM-200 participates in the development and review of maintenance plans. In addition, ASM-200 develops national Airways Facilities sector staffing standards for the MALSR program and validates maintenance staffing requirements. The program manager ensures the project is in conformance with staffing, training, certification policies, guidelines and requirements.

c. Spectrum Engineering Division (ASM-500). ASM-500 obtains frequency authorizations necessary to satisfy the requirements of the National Airspace System (NAS). This division also provides engineering support to regional and field facilities in the resolution of and prevention of radio frequency interference to NAS facilities.

d. NAS Support Division (ALG-200). ALG-200 develops, recommends and issues agency systems, procedures, standards, and policies for materiel, supply, property management. This division also develops the required logistics policies, plans, and standards required to support the National Airspace Integrated Logistics Support (NAILS) process.

e. Contracts Division (ALG-300). ALG-300 performs cost/price analyses of contractor's proposals and participates as a member of the Source Evaluation Board on MALSR with RMS procurements subject to the contracting officer. In addition, ALG-300 provides procurement support for the MALSR programs and plans, and places, and administers contracts for the MALSR with RMS equipment. ALG-300 also designates a contracting officer (CO) who is responsible for all contractual matters. The CO is the only individual authorized to approve contract changes impacting price, delivery or schedule.

f. Industrial Division (ALG-400). ALG-400 performs factory inspection of the MALSR with RMS. ALG-400 assigns a quality/reliability officer (QRO) at the time the contract is awarded. The QRO is the FAA's representative at the contractor's facility and is responsible for verifying quality control. The QRO is directed by FAA policy and procedure, and by the terms and conditions of the contract.

g. FAA Depot (AAC-400). AAC-400 accepts deliveries of MALSR systems from the manufacturer and manages the dissemination of MALSR systems at the regions request. AAC-400 is responsible for logistics support.

h. FAA Academy (AAC-900). AAC-900 provides maintenance training and coordinates with ASM-200 in the development of a training plan. A system user guide will be provided for the training of air traffic personnel.

i. Technical Training Division (AHT-400). AHT-400 analyzes training proposals prepared by ASM-200 and initiates action to meet training requirements in a timely manner.

j. Flight Standards Service Planning and Program Management Branch (AFS-12). AFS-12 manages the prioritization and validation of equipment and facilities for the MALSR program.

k. FAA Aviation Standards National Field Office. The FAA Aviation Standards National Field Office is responsible for providing the coordination to accomplish their following functions:

(1) Providing the support necessary for accomplishing the preliminary (preparatory) and commissioning flight inspections, as required.

(2) Determining if the operational status of a facility or system is in accordance with the established tolerances.

(3) Certifying the facility or system for operational use in the NAS when all operational requirements have been met.

(4) When applicable, ensuring that required Notices to Airmen (NOTAMS) are issued for any facility or system restriction.

l. FAA Regional Offices. The FAA regional offices through established administrative structures coordinate with all responsible parties to assure adequate funding, establish system commissioning/service availability dates, assign project field representatives and determine utility availability for the MALSR system. The regions also provide field engineering as required to support preparations for the installation of the MALSR system and the installation of RRCS equipment to monitor/control the visual aids; order Government Furnished Materials (GFM) for tools and test instruments to support installation and acceptance; tailor installation drawings to be site specific; initiate work orders and travel authorization; and assign field personnel. If air-to-ground radio control equipment is required, the region will purchase the unit. The following regional offices are responsible for the coordination required to accomplish the functions listed below:

(1) Regional Airway Facilities Division.

(a) Installing facilities systems and equipment in accordance with established standards, specifications and instructions.

(b) Notifying the appropriate sector that a project has been funded and issuing a projected implementation schedule.

(c) Providing the sector an opportunity to review and participate in project plans during the engineering phase and for furnishing the sector a copy of the engineering plans and contract documents.

(d) Providing the sector a copy of the project work order at least 10 days before the start of project work.

(e) Providing the appropriate facility reference data file (FRDF) information to the sector for inclusion in the FRDF.

(f) Providing the essential facility, system, and equipment technical reference and performance parameters as part of the project transmittal when maintenance technical handbook parameters are not available.

(g) Ensuring that all modifications, Configuration Control Documents (CCDs), manufacturer's field changes, and factory changes are current and documented for equipment received from sources outside the Airway Facilities sector.

(h) Notifying the joint acceptance board chairman of when the facility will be ready for JAI, providing the sector all data necessary to prepare warranty failure reports on items failing prior to JAI, and providing regional Airway Facilities division representatives for participation in the JAI.

(i) Establishing and maintaining a followup file for monitoring and clearing all JAI report exceptions, reviewing all JAI reports and followup reports for correctness, completeness and proper distribution, taking appropriate and timely actions to clear JAI report exceptions, and identifying additional sources of funds or initiating budgetary action, as necessary, to clear exceptions.

(2) <u>Airway Facilities Sector</u>.

(a) Reviewing contract documents and engineering plans during the engineering phase and providing comments to the regional Airway Facilities division.

(b) Providing personnel as required at appropriate times throughout the project to witness and/or participate in construction, installation, tuneup, tests, and collection of technical reference data.

(c) Coordinating the release of equipment currently in use to regional Airway Facilities division establishment personnel for use in the project.

(d) Properly maintaining those components of an existing facility which are unaffected by an improvement project.

(e) Ensuring that modification/CCDs and documentation are current on installed equipment for the purpose for which the equipment was being used prior to the project.

(f) Providing a representative to serve as the joint acceptance board chairperson and other qualified personnel for participation in the JAI, preparing and distributing the JAI report, and assuming maintenance responsibilities and custodianship for facilities, systems, or equipment at the conclusion of JAI.

(g) Coordination and followup on exceptions after the JAI to include exceptions assigned to other organizations or to a contractor for clearance, clearing exceptions which have been assigned to the sector, reporting the clearance of exceptions, and reviewing all waived exceptions to determine if actions will impact sector operations or other organizations.

(h) Maintaining all equipment warranty information and reporting equipment failing under warranty.

(i) Receiving, storing, and shipping project materials and disposing of excess equipment and materials.

(3) Regional Logistics Division. Providing representatives to participate in specific projects which the regional Airway Facilities division has identified as having major logistical problems and has requested the participation by the regional Logistics division.

(4) Regional Flight Standards Division. Providing technical expertise to the regional Airway Facilities, as required, for accomplishing JAIs and the commissioning of facilities and systems.

m. Contractor. The contractor, when requested by APS-450, provides engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractor concerning proper installation or operation of MALSR with RMS.

53. PROJECT RESPONSIBILITY MATRIX. Figures 5-1 illustrates the FAA organizations responsible for the implementation of each significant function of the MALSR project.

54. PROJECT MANAGERIAL COMMUNICATIONS. The MALSR program manager within APS-450 is the focal point for all internal project communication. Organizations supporting the MALSR program designate a representative to maintain close communication with the Approach Lighting & Visual Range Program Branch. Supporting organizations maintain communications with both the contractor and internally within the FAA. The meetings listed below are the regularly scheduled project meetings, or conferences.

a. The National Airspace Integrated Logistics Support (NAILS) Meeting. These meetings are held to ensure that there is an interrelated, unified and iterative approach to the managerial and technical activities which support the National Airspace System (NAS). During these meetings issues effecting NAILS,logistics management, maintenance planning, equipment shakedown testing, supply support, test and support equipment, manpower and training support, support facilities, technical data, and packing, handling, storage and transportation are discussed and resolved. The meetings are held on a semiannual basis at the FAA Headquarters.

b. Program/Project Status Review Boards. These boards are held on a monthly basis at the FAA Headquarters to discuss project status and to resolve problems and issues effecting all phases of the project from the time that the requirements are established until system deployment has been completed.

55. IMPLEMENTATION STAFFING. There are no personnel requirements peculiar to the implementation phase of the project.

56. PLANNING AND REPORTS. None required.

57. APPLICABLE DOCUMENTS. Within this PIP the following documents have been referenced.

a. Advisory Circular, AC 150/5345-49A, Specification L-854, Radio Control Equipment, August 8, 1986.

b. Contract DTFA-01-89-Y-01010, dated 6/29/89 for Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights and Remote Monitoring Subsystem.

c. FAA-E-2325d, Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights, January 3, 1984.

d. FAA-E-2663, Interface Unit MALSR Remote Control, November 18, 1976.

e. FAA-E-2723, Remote (Radio) Control System, December 21, 1982.

f. FAA-E-2750/1, Airport Remote Monitoring System (ARMS), Part I, General Requirements, May 23, 1985

g. FAA-E-2750/2, Airport Remote Monitoring System (ARMS), Part 2, Link Control Unit, May 23, 1985.

h. FAA-E-2750/4, Airport Remote Monitoring System (ARMS), Part 4, Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) Remote Monitoring Subsystem (RMS), February 12, 1986.

i. FAA-E-2782, Remote Maintenance Monitoring System, Core System/Segment Specification, July 14, 1986.

j. FAA-G-2100e, Electronic Equipment, General Requirements, March 11, 1987.

k. FAA Order 1800.8E, NAS Configuration Management, July 11, 1985.

l. FAA Order 1810.4, ADL Test and Evaluation Program, December 30, 1987.

m. FAA Order 6000.26A, Reliability and Maintainability Policy, May 14, 1982.

n. FAA Order 6030.45, Facility Reference Data File, March 28, 1974.

o. FAA Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981.

p. FAA Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities, November 1987.

q. NAS-DD-1000B, Level I Design Document, May 1986.

r. NAS-MD-110, Test and Evaluation (T&E) Terms and Definitions for the National Airspace System, March 27, 1987.

58.-59. <u>RESERVED</u>.

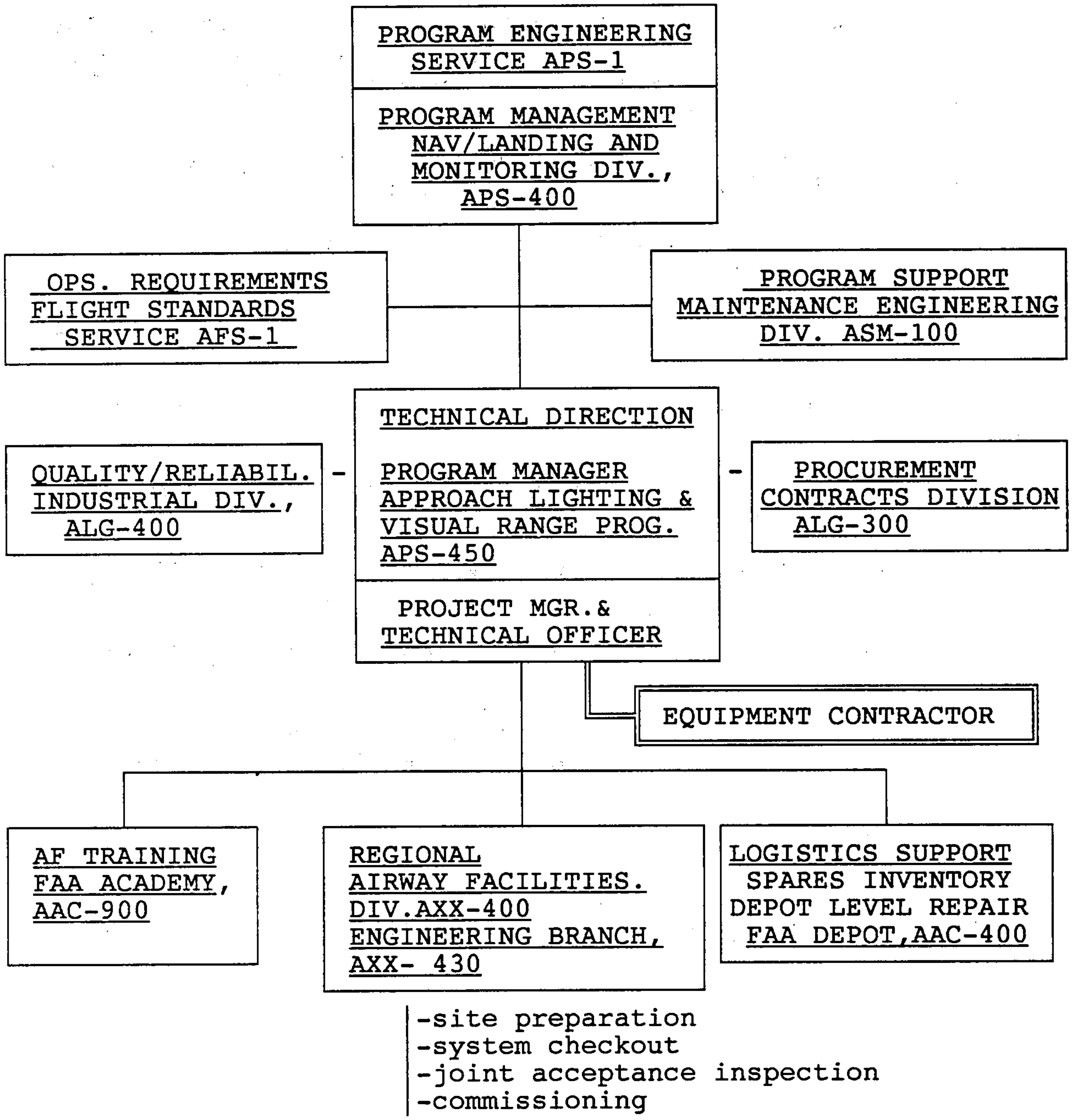

FIGURE 5-1. PROJECT RESPONSIBILITY MATRIX

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. Project funding for the MALSR has been provided through FY88. The current contract was awarded on June 29,1989, is for 83 MALSR systems. Outyear requirements will be determined by the urgency of the requirement and the availability of funds.

61.-69. RESERVED.

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of MALSR systems is conducted by the FAA Depot at the Aeronautical Center and the FAA regions. As regional funds become available, requests from the regions to satisfy airport requirements are honored by the depot. The MALSR with RMS is shipped by the depot to the site where it is stored for installation. Installation of the equipment is the responsibility of the region. Table 7-1 depicts the MALSR with RMS Deployment Readiness Review (DRR) Schedule.

Event	Date
Delivery to T&E Site	TBD
Shakedown Testing Complete	TBD
Final Rpt. to Assoc. Admin.	TBD
Excomm Meeting	TBD

TABLE 7-1. MALSR WITH RMS DRR SCHEDULE

71. SITE PREPARATION. The regions are responsible for preparing the sites where MALSR equipment will be installed. Site preparation includes planning for installation and integration with the remote radio control system at both the tower and at the runway location. Considerations for site preparation include weather conditions and concurrent construction activities.

72. DELIVERY. MALSR systems will be shipped to the FAA Depot and will be available to the regions under the constraints of fiscal year funding. The depot ships equipment to the regions as requests are made and in accordance with the quantities called out in the project status report (PSR). Projected delivery dates are contained in Chapter 4. Implementation of the project is scheduled to be completed in December of 1992.

73. INSTALLATION PLAN. The FAA regions shall coordinate the receipt, installation and evaluation of all equipment required to form the MALSR system. The MALSR with RMS shall be installed in accordance with national standard drawings and standards revised to fit the individual site. The Regional office shall coordinate the complete installation, alignment, and operational tests on all identified MALSR interfaces to assure full compliance with

FAA specifications and performance. The Contractor shall provide engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractors concerning the proper interfacing of the air-to-ground receiver, RRCS, TCCC and RMMS to the MALSR with RMS when required. Performance analysis and evaluation reports shall be forwarded to the FAA Regional Office for acceptance.

74. CONFIGURATION MANAGEMENT PLAN. Configuration Management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status. Configuration items of concern for this implementation are the Identifier Assemblies, Control Cabinet, Link Control Unit and the Remote Monitoring Subsystem Interface baselines. The configuration management discipline shall be applied to all configuration items included in the MALSR with RMS baselines to ensure compatibility between elements within the MALSR with RMS. All additions and changes to the MALSR with RMS baselines shall be proposed in the form of a case file, and shall be reviewed for recommended approval or disapproval by a Configuration Control Board (CCB). All changes to the NAS site design baseline, the Identifier Assemblies, Control Cabinet, Link Control Unit and the Remote Monitoring Subsystem Interface must be processed and approved by the Navigation/Landing and Facility Monitoring Cluster (APS-400) CCB.

a. Acquisition Phase Configuration Management. The Navigation/Landing and Facility Monitoring Cluster (APS-400) Configuration Control Board (CCB) controls the establishment of and changes to the MALSR with RMS hardware baselines during the acquisition phase. For MALSR with RMS matters, the APS-400 CCB will include members from National Airway Engineering Field Support Sector, ASM-150, Spectrum Engineering Division, ASM-500, NAS Planning & Program Management Division, ASE-100, System Engineering Branch, ASE-210, Communications/Navigation/Surveillance Division, ACN-200, Air Transportation Division, AFS-200 and the, Configuration Management Branch, ASE-220. The APS-400 CCB is responsible for ensuring that the functional, performance, and interface requirements allocated to the MALSR with RMS hardware subsystems are reflected in the baselines, and in any changes to those baselines until product acceptance. The APS-400 CCB is also responsible for ensuring that baseline documentation is accurate and reflects MALSR with RMS operational requirements. Baseline documentation includes specifications and interface control documents (ICDs) and IMCS software. The MALSR will use LCU/MPS IMCS software and modules. The APS-400 CCB retains this CM responsibility throughout the MALSR life cycle.

The transition of configuration management responsibilities associated with MALSR with RMS hardware products occurs at acceptance by the APS-400 CCB designated representative of the contractor's delivered, installed, integrated, and tested hardware product. Hardware product acceptance is based on successful operational readiness demonstration (ORD) of the complete MALSR system. ASM-100 will be invited to participate in a joint "Shakedown" test at the T&E site in order to conserve project funds and preclude duplication of effort. At product acceptance, the change control functions and CCB records associated with hardware products that effect Level III drawings and instruction books transition from the APS-400 CCB to the Maintenance Engineering (ASM-100) CCB.

b. Operational Support Phase Configuration Management. During the operational support phase, and for the entire life-cycle of the implemented hardware enhancements, configuration management functions will consist of maintenance and change control management of site as well as product baseline (Level III Design). The ASM-100 CCB assumes baseline and change control management of the Identifier Assemblies, Control Cabinet, Link Control Unit and the Remote Monitoring Subsystem Interface hardware products and associated peripherals as each product is commissioned for operational service (via Memorandum of Agreement), and of related NAS site design baselines (including logistics and training). The ASM-100 CCB is responsible for change control management of the MALSR with RMS hardware product baseline by MOA. Hardware product baselines are maintained by National Airway Engineering Field Support (ASM-150) personnel in the field. The contractor shall provide engineering changes to ASM-150 when the changes are released, and prior to field implementation. ASM-150 shall evaluate the changes and approve the change for field implementation via a case file. The configuration management functions assigned to the ASM-100 CCB are described in the ASM-100 CCB charter.

75.-79. RESERVED

CHAPTER 8. VERIFICATION

80. FACTORY VERIFICATION. The contractor performs a series of tests in accordance with the requirements of the contract, the equipment specification, FAA-G-2100e, Electronic Equipment, General Requirements, and other documents prior to acceptance of the equipment by the FAA. These tests, design qualification tests, type tests, and production tests will demonstrate that all hardware, software, and all performance requirements are met before the FAA accepts a MALSR system from the contractor.

81. CHECKOUT. After installation of equipment by the regions, FAA personnel conduct checkout tests in accordance with the contractor developed equipment instruction books. The procedures followed include testing electrical and mechanical hardware interfaces, verifying system performance, testing interfaces through diagnostics, and verifying maintenance capability and adequacy of support hardware and software.

82. CONTRACTOR INTEGRATION TESTING. Not applicable.

83. CONTRACTOR ACCEPTANCE INSPECTION (CAI). Not applicable.

84. FAA INTEGRATION TESTING. These tests are conducted to verify that the MALSR system has been integrated as specified and that it can interface with the specified external systems. Included are tests that verify the operation of multiple interfaces and integration with other systems in the operational environment. At this point in time, the MALSR system should have been adapted to parameters of the operational equipment with which it must interface.

85. SHAKEDOWN AND CHANGEOVER. System shakedown is the critical period of testing that is performed after the FAA takes full responsibility for equipment/systems and software. Evaluations to determine the adequacy and acceptability of procedures and operations to demonstrate an initial operating capability (IOC) shall be accomplished prior to system shakedown. System shakedown ends when JAI activities begin. During system shakedown, tests and checks are conducted on the automated system to verify that it functions properly, meets operational requirements, and is maintainable. System shakedown permits facility personnel to become familiar with the system, learn its limitations, and to become proficient in diagnosing problems and effecting repairs. Shakedown activities include accomplishment of the following activities:

a. Operational and maintenance proficiency and hands-on training.

b. Evaluations to determine the adequacy of system failure detection and recovery procedures.

c. Live testing of operational functions, including specific adaption data, and system configuration.

d. Evaluations to determine the suitability of displayed operational data.

86. JOINT ACCEPTANCE INSPECTION (JAI). A joint acceptance inspection is conducted in accordance with FAA Order 6030.45, Facility Reference Data File to gain the consensus of involved office that the MALSR project has been completed in accordance with applicable standards and specifications and that the facilities are capable of providing the services required within established standards and tolerances. The JAI ensures compliance with requirements in the following areas:

a. Facility Construction and Equipment Installation.

b. Facility/System/Equipment Performance.

c. Facility Technical Performance Documentation and Maintenance Reference Data.

d. Facility Logistics Support.

e. Final Acceptance and Commissioning.

87.-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The concept of maintenance for the MALSR System shall consist of both site and depot repair. Maintenance Technicians (either FAA and/or contractor) will replace MALSR with RMS components down to the line replaceable units (LRU) and may perform limited repair/corrective and preventative maintenance functions as required, on-site. Depot maintenance will consist of receipt and repair/replacement of failed LRUs. These functions can be performed by either the FAA and/or a commercial contractor.

91. TRAINING. The training program for the MALSR system is contained in the MALSR Subsystem Training Plan. Assignment of training quotas for the regions will be made by ASM-210 for Airway Facilities (AF) personnel. Projected training requirements by individual work centers/facilities and principal training milestones are included in this training plan. Initial training of FAA AF personnel will be conducted by the contractor at the contractor's facility. Training courses are developed and conducted for those technicians who perform maintenance on MALSR systems and FAA Academy personnel who will be generating academy resident training courses. Training course graduates will be able to configure the MALSR system for normal operation and system testing using manufacturers instructions and FAA Handbook Specifications. They will possess sufficient knowledge to troubleshoot and repair to LRU level and to perform and document all periodic maintenance.

92. SUPPORT TOOLS AND TEST EQUIPMENT. This section describes support and test equipment, including all common and special tools, as well as any connectors or other interface devices necessary to connect the support equipment to the end item or Unit Under Test (UUT). Test equipment is supported at the AF sector office having responsibility for the visual aid facility.

a. Common tools, test/support equipment, interface devices and connectors for maintenance of the MALSR System. The contractor provides a list of the common tools, test/support equipment, interface devices and connectors required for maintaining MALSR with RMS equipment at all levels of maintenance.

b. Special tools, special test/support equipment and special interface devices for maintaining the MALSR with RMS.

Special tools, test/support equipment, and/or interface devices required to support the MALSR with RMS will be held at a minimum. Special tools or test equipment required for initial adjustments (i.e. aiming instrument), testing, and/or maintenance of the MALSR with RMS are provided with the equipment.

93. SUPPLY SUPPORT. The FAA depot is responsible for providing supply support to the MALSR with RMS in the forms of maintaining inventory records and the Master FAA catalog, and interfacing with the Federal Cataloging System.

94. VENDOR DATA AND TECHNICAL MANUALS. Instruction books for the MALSR system are provided by the contractor and reviewed by the FAA prior to acceptance. Instruction books are provided with each MALSR system that is delivered. Other technical manuals to be provided by the contractor include, reliability, maintainability documentation, and test procedures, and drawings.

95. EQUIPMENT REMOVAL. For systems installed under the Visual Navaids establishment program no equipment removal is required. Systems installed under the Approach Lighting System Improvement Program (ALSIP) may require removing existing MALSR systems with rigid tower structures, or removing SSALF, SSALR, or ALSF-1 systems and replacing them with MALSR systems with light-weight and low-impact resistant structures.

96. FACILITIES. Not applicable.

97. EQUIPMENT NOT FURNISHED. The following is a list of equipment that may be required for a MALSR with RMS but is not furnished.

a. Frangible couplings.

b. 2-inch (5.08 centimeter) electrical metallic tubing (emt) conduit.

c. Portable terminal for local control and monitoring of the airport RMS.

d. UHF radios for RMS and LCU radio links.

e. External modems for DTE interfaces.

f. Padlocks.

g. PAR-28, 120-watt, 120-volt GE Wattmiser spot lamps (or equivalent).

h. PAR-56, 300-watt, 120-volt threshold spot lamps.

i. L-850B and L850E semiflush lighting fixtures.

j. 300-watt, 240/45.5-volt and 200-watt, 240/32.3-volt direct earth burial (DEB) transformers for semiflush lighting fixtures.

k. Low-impact resistance structures.

l. Batteries and battery charging system for the LCU and RMS back-up power.

98.-99. RESERVED.